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(54) Pressure Impregnation of Wood Poles for Preservation

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PRESSURE IMPREGNATION OF WOOD POLES FOR PRESERVATION

Abstract of the Disclosure

A treatment for wood poles, as used for telecommunications and electric power poles, to reduce surface hardening comprises modifying the standard treatment solution by the addition of a polymer of ethylene oxide. A surface active agent is a further possible additive, and reduction of the hexavalent chrome ion in the standard solution is a further modification.

This invention relates to the preservation of wood poles, particularly wood poles as are used for telecommunications and electric power cables.

Telephone and other poles are conventionally treated with chrome copper arsenate type preservatives. However a problem with such preservatives is that there is a tendency for the outer portion of a pole, the sapwood, to harden. This creates problems for servicing personnel who climb the poles using climbing spurs clamped to their boots. The hard sapwood restricts entry of spurs. Also checking of the wood can occur.

The present invention relates to the modifying of the chrome copper arsenate solution to avoid, or at least reduce, hardening of the sapwood, with improved pole climbability.

From experience it has been found that, as stated above, the chrome copper arsenate treatment tends to make the surface of treated poles harder than the corresponding white stock, or untreated stock. It has been found that hard surface poles have a higher concentration of chrome ion near the surface than in other areas of the poles radial cross-section. The chrome is the apparent reason in the hardening phenomenon, as amoniacal copper arsenate and acid copper arsenate do not appear to harden the wood as much as chrome copper arsenate does. The reason for the preservative concentration at the surface nor the cause of hardening of the wood is not fully understood.

There appears to be at least two plausible reasons for the high concentration of the preservative salts at the surface of the wood. One reason is that the outer wood, or sapwood, is more

porous than the inner wood, or heartwood. Because of its porosity, the sapwood is more capable of holding a solution than is the heartwood, and the chrome reacts with the reactive sites in the wood material matrix. Another reason considered, for the high concentration, is that the hexavalent chrome oxide is so reactive with the sugars and other materials in the sapwood that the combination forms a semi-solid product that blocks further penetration of preservation into the wood matrix.

The actual mechanism of hardening of the pole surface is even more obscure than the mechanism of concentration of chrome ion. One theory is that the chrome oxide converts some of the lignin and sugars to a water soluble compound, which is then extracted from the wood, similar to weathering. The remaining cellulose-lignin composite then shrinks resulting in a case hardening mechanism. Another theory is that chrome oxide reacts to polymerize the lignin phase of the cellulose-lignin composite to form a cellulose-chrome lignin composite that is harder than the original composite. Neither of these theories are proven, but it has been found that these two reactions can exist.

After considering the problems and finding out the feature of concentration of chrome ion near the surface of the pole, and developing the above related reasons and theories, it is still not obvious as to what should be done to alleviate the problems. It is proposed to provide a variation in the preservative solution to give a formulae which, while retaining the preservative action, will mitigate hardening. One treatment is to use a polymer of ethylene oxide, generally referred to as polyethylene glycol (PEG). A

preferred molecular weight range is from about 500 to 2,000, although down to 100 has been used, but is not fully effective. The concentration can vary from about .5 to 10% by volume. As a particular example, a standard water based solution of 2% concentration of chromium, copper and arsenic salts is modified by a 10% concentration of 1000 molecular weight polymer of ethylene glycol (PEG 1000). The polymer acts as a "moisturizer" for the wood matrix and as a buffer for the chrome oxide to retard its agressive chemical reactivity to wood sugars lignins etc. The moisturizing action of the PEG 1000 occurs in that the PEG fills the pores of the wood and then attracts and binds water to its own matrix. This is believed to impart softening to the outer surface of the wood, provide some lubricity for climbing spurs and at least reduce checking or splitting in the pole.

A further example is the addition of a surface active agent to aid penetration of the heartwood, to reduce the concentration in the sapwood. An additional effect is the possibility of allowing the excess chrome to be easily withdrawn on irrigation by fresh water.

Another example is to reduce the hexavalent chrome ion present, for example to 2/3 of that of the normal solution. This also increases penetration.

As explained, the actual mechanisms resulting in the hardening of the pole surface is not fully understood. However, by considering the various problems and effects it has been possible to propose novel treatments which are effective, even though it is not fully understood how the treatments provide the desired results.

The poles are treated with the solutions in the conventional way, that is by positioning in a chamber which is first evacuated to extract as much air as possible and then pressurizing with the treatment solution.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. The method of preserving wood by treatment with a standard water based solution of chrome, copper and arsenate salts, characterized by the addition of a polymer of ethylene oxide to the solution prior to treatment of the wood.

2. The method of claim 1, characterized by the polymer of ethylene oxide having a preferred molecular weight range from about 100 to about 2,000.

3. A method as claimed in claim 2, wherein the preferred molecular weight range is from about 500 to about 2,000.

4. A method as claimed in claim 3, comprising treating the wood with a water based standard solution of about 2 to 2.5% concentration of chromium copper and arsenic salts modified by the addition of a .5% to 10% concentration of 1,000 molecular weight polymer of ethylene glycol.

5. A method as claimed in claim 1 including the addition of a surface active agent to the solution.

6. A method as claimed in claim 1, including maintaining the hexavalent chrome ion in the solution to a maximum of 2/3 of that in a standard solution.

7. The method of preserving wood by treatment with a water based standard solution of the chrome-copper-arsenate type at a solution strength of about 2% to 2.5% characterized by the addition of a .5% to 10% concentration of 1,000 molecular weight polymer of ethylene glycol.

8. The method of claim 7 including the addition of a surface active agent to the solution.

9. The method of claim 7 including maintaining the hexavalent chrome ion in the solution at a maximum of 2/3 of that in a standard solution.

10. A method as claimed in claim 1, wherein the wood is treated in a chamber by first evacuating the chamber for a predetermined period after placing the wood in the chamber, and then pressure treating the wood with the solution at a predetermined pressure for a predetermined period.

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